## REMARKS

The June 15, 2006 Final Office Action was based on pending Claims 1–38. By this Response, Applicant is amending Claims 1, 4, 6, 7, 10, 14, 16, 17, 19, 23, 28, 30, 31, and is cancelling Claims 8 and 18 without prejudice or disclaimer. Claims 2, 3, 5, 9, 11–13, 15, 20–22, 24–27, 29 and 32–38 remain as originally filed or as previously presented.

Thus, after entry of the foregoing amendments, Claims 1–7, 9–17 and 19–38 are pending and presented for further consideration. In view of the foregoing amendments and the remarks set forth below, Applicant respectfully submits that Claims 1–7, 9–17 and 19–38 are in condition for allowance.

## SUMMARY OF REJECTIONS

The June 15, 2006 Final Office Action rejected Claims 1, 4, 5 and 9 under 35 U.S.C. § 102(b) as being anticipated by U.S. Patent No. 6,273,108 to Bergman et al. ("Bergman").

The Final Office Action also rejected Claims 2 and 3 under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of U.S. Patent No. 5,593,505 to Erk et al. ("Erk"). Claims 6, 10–14, 17, 18, 22–27 and 29–36 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of U.S. Patent No. 6,124,158 to Dautartas et al. ("Dautartas").

Claims 16, 19, 28 and 37 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of Erk and in further view of Dautartas. Claims 16, 19, 28 and 37 were also rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of Erk and in further view of Dautartas, and in further view of U.S. Patent No. 5,902,407 to de Boer et al. ("de Boer").

Claims 7 and 8 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of U.S. Patent No. 5,695,092 to Schrandt ("Schrandt"). Claims 20 and 21 were rejected under 35 U.S.C. § 103(a) as being unpatentable over Bergman in view of Dautartas and in further view of Schrandt.

**CLAIMS 15 AND 38**

Neither the January 4, 2006 Office Action nor the June 15, 2006 Final Office Action indicated that Claims 15 and 38 were rejected in view of the cited art. Thus, Applicant respectfully submits that Claims 15 and 38 are in condition for allowance.

**CLAIM REJECTIONS UNDER 35 U.S.C. § 102(b)**

The Office Action rejected Claims 1, 4, 5 and 9 as being anticipated by U.S. Patent No. 6,273,108 to Bergman. For at least the reasons set forth below, Applicant respectfully disagrees and requests reconsideration of the aforementioned claims.

**Independent Claim 1**

Amended independent Claim 1 recites an apparatus comprising a sprayer, a rotator and a wafer-processing chamber having an ozone-rich environment. The rotator rotates a wafer and creates a gap between the wafer and a wafer cassette. The apparatus further includes a pulsating liquid source configured to pulse a liquid solution through the sprayer while the wafer is rotating, the pulsating liquid source having a duty cycle that varies between 3% and 97%.

Bergman does not disclose the apparatus of independent Claim 1. For instance, Bergman does not disclose "a rotator that creates a gap between a wafer and a wafer cassette," as recited by Claim 1. Rather, as shown and described with reference to Figures 1 and 2 of Bergman, semiconductor workpieces 20 (wafers) are supported directly by one or more supports 25. These supports 25, which also appear to be characterized as a wafer cassette in column 5, lines 47–53, are coupled to a rotor assembly and are configured to rotate the workpieces 20. Although the Office Action generally asserts that Figures 1 and 2 of Bergman illustrate a gap between a cassette and a wafer, Applicant was unable to see such a structure in the identified figures. Rather, it would appear from the disclosure of Bergman that the supports 25 would need to have direct contact with the wafers in order to provide for rotation of the wafers.

Furthermore, Bergman does not disclose a pulsating liquid source configured to pulse through the sprayer a liquid solution at a duty cycle that varies between 3% and 97% while the wafer is rotating. Although the Office Action characterizes the pumping

mechanism 55 of Bergman as a pulsating fluid source, Bergman appears to suggest otherwise. In particular, Bergman discloses at column 4, lines 36–38, that the pump mechanism 55 "provides liquid under pressure along a fluid flow path." Bergman further discloses the flow rate of the liquid as being a continuous spray (see col. 6, lines 17–36). Bergman does not disclose the pumping mechanism 55 as being configured to pulse a solution through a sprayer at a duty cycle that varies between 3% and 97%.

Because Bergman does not disclose each limitation recited in Claim 1, Applicant asserts that Claim 1 is not anticipated by Bergman, and Applicant respectfully requests allowance of Claim 1.

**Response to Applicant's Previous Arguments**

In reply to Applicant's Response mailed March 31, 2006, the June 15, 2006 Final Office Action states that the arguments therein with respect to Claim 1 do not relate to "structural limitations but are based upon process limitations that can inherently be performed by the prior art of Bergman."

As indicated in M.P.E.P. § 2173.05(g), claims may include limitations that define an element by what it does. Such limitations "must be evaluated and considered, just like any other limitation of the claim, for what it fairly conveys to a person of ordinary skill in the pertinent art" (see M.P.E.P. § 2173.05(g)). Therefore, Applicant submits that the limitations of Claim 1 that relate to the rotator and the pulsating liquid source set definite boundaries on the patent protection sought and that one with ordinary skill in the art would understand the scope of the claim.

Furthermore, the Final Office Action states that the "process limitations" of the Claim 1 "can inherently be performed by the prior art of Bergman." Applicant respectfully disagrees with the Office Action's characterization of Bergman and respectfully submits that such a rejection is improper. Rather, the Office Action must provide a rationale or evidence showing that the claimed subject matter is necessarily present in Bergman (see M.P.E.P. § 2112(IV) stating "[t]he fact that a certain result or characteristic may occur or be present in the prior art is not sufficient to establish the inherency of that result or characteristic" (emphasis added) and "[i]nherency . . . may

not be established by probabilities or possibilities. The mere fact that a certain thing may result from a given set of circumstances is not sufficient").

**Dependent Claims 4, 5 and 9**

Claims 4, 5 and 9 depend from independent Claim 1 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to amended Claim 1 and for the additional features recited therein.

**CLAIM REJECTIONS UNDER 35 U.S.C. § 103(a)**

The Office Action rejected Claims 2 and 3 as being unpatentable over Bergman in view of Erk. Claims 6, 10–14, 17, 18, 22–27 and 29–36 were rejected as being unpatentable over Bergman in view of Dautartas. Claims 16, 19, 28 and 37 were rejected as being unpatentable over the three-way combination of Bergman, Erk and Dautartas.

The Office Action also rejected Claims 16, 19, 28 and 37 as being unpatentable over the four-way combination of Bergman, Erk, Dautartas and de Boer. Claims 7 and 8 were rejected as being unpatentable over Bergman in view of Schrandt. Claims 20 and 21 were rejected as being unpatentable over the three-way combination of Bergman, Dautartas and Schrandt.

For at least the reasons set forth below, Applicant respectfully disagrees with these rejections and the characterization of the cited art, and Applicant respectfully requests reconsideration of the aforementioned claims.

**Independent Claim 10**

Focusing on amended independent Claim 10, in one embodiment of Applicant's invention an apparatus is disclosed for processing a wafer. The apparatus includes a semiconductor processing chamber, a rotator and a pulsating liquid source. The rotator is configured to rotate at least one wafer within the semiconductor processing chamber. The pulsating liquid source is configured to pulse an ozone-rich liquid solution into the semiconductor processing chamber more than once while the wafer is rotating within the semiconductor processing chamber, the pulsating liquid source having a duty cycle that varies between 3% and 97%.

As discussed in more detail below, the cited art does not render obvious the invention recited in Claim 10.

**Bergman**

Bergman is directed to an apparatus and method for cleaning the surface of a semiconductor workpiece. The Office Action appears to indicate that Bergman teaches a wafer processing chamber and a rotator. In particular, Bergman discloses applying a continuous spray of deionized water to maintain the workpiece at an elevated temperature and rotating the workpiece at high speeds during cleaning (see, e.g., col. 6, lines 26–36). The Office Action also acknowledges that Bergman does not teach a pulsating liquid source as recited in Claim 10.

**Dautartas**

Dautartas is directed to a hot-wall reaction chamber process for atomic layer deposition of a thin film of gate dielectric. In particular, Dautartas appears to teach creating an ozone gas pulse, not multiple liquid pulses, to oxidize carbon contaminants to form gasses, which are subsequently purged from its reaction chamber (see, e.g., col. 5, line 55 to col. 6, line 40). Furthermore, Dautartas does not appear to specify any duty cycle.

**Combination of Bergman and Dautartas**

The Office Action states that "it would have been obvious at the time of the claimed invention to modify the apparatus of Bergman . . . in view of the pulsed valves of Dautartas." The Office Action further states that the "motivation to include the pulsed valves of Dautartas [with the apparatus of Bergman] is that they provide enhanced flow control, increased efficiency and reliability."

Applicant respectfully submits that such a combination is improper because there is no suggestion or motivation to combine these references to teach the claimed invention. The fact that references can be combined is not sufficient to establish obviousness (see M.P.E.P. § 2143.01(III)). Rather, M.P.E.P. § 2143.01 requires that the motivation to combine references must come from: (1) the nature of the problem to be solved, (2) the teachings of the prior art and/or (3) the knowledge of persons of

ordinary skill in the art. The Office Action's stated motivation to combine based on "enhanced flow control, increased efficiency and reliability" does not appear to relate to any of the acceptable sources for a motivation to combine. For instance, the stated motivation appears to have no relation to the nature of the problems addressed and solved by the claimed invention, as detailed in Applicant's specification.

In addition, Applicant submits that the nature of each of Bergman and Dautartas teaches away from such a combination and from the wafer-processing apparatus of independent Claim 10, which includes a pulsating liquid source configured to pulse an ozone-rich liquid solution into a semiconductor processing chamber while a wafer is rotating. For instance, Dautartas concerns a hot wall reactor usable to form semiconductor thin film structures on a wafer through atomic layer epitaxy. Dautartas discloses using a pulse of ozone gas to react with, or oxidize with, carbon contaminants in the film. Bergman, on the other hand, teaches using a continuous spray of a liquid to maintain a semiconductor workpiece at an elevated temperature during cleaning (see, e.g., col. 6, lines 24–35). Such a disclosure by Bergman teaches away from using Dautartas' gas pulse source with the workpiece-cleaning apparatus of Bergman.

Furthermore, even if Bergman and Dautartas are combined, they do not teach or suggest every limitation of Claim 10. For instance, the references do not teach or suggest a wafer-processing apparatus having a pulsating liquid source that pulses an ozone-rich liquid solution into a semiconductor processing chamber, during rotation of the wafer, at a duty cycle that varies between 3% and 97%. That is, an apparatus for simultaneous pulsing of a liquid solution and rotating of a wafer is not suggested or taught by the cited references.

**Summary**

Because Bergman and Dautartas are not properly combinable and, even if combined, do not teach or suggest an apparatus having a pulsating liquid source that pulses an ozone-rich liquid solution into a semiconductor processing chamber during rotation of the wafer, the pulsating liquid source having a duty cycle that varies between 3% and 97%, Applicant asserts that Claim 10 is patentably distinguished over the cited references, and Applicant respectfully requests allowance of Claim 10.

**Independent Claims 17, 23 and 31**

Amended independent Claims 17, 23 and 31 are believed to be patentably distinguished over the cited art for reasons similar to those set forth with respect to the patentability of amended independent Claim 10 and for the different aspects recited therein.

**Dependent Claims 2 and 3**

Claims 2 and 3 depend from amended independent Claim 1 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 1 and for the additional features recited therein.

**Dependent Claim 6**

Claim 6 depends from amended independent Claim 1 and is believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 1 and for the additional features recited therein.

**Dependent Claims 7 and 8**

Claims 7 and 8 depend from amended independent Claim 1 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 1 and for the additional features recited therein.

**Dependent Claims 11–16**

Claims 11–16 depend from amended independent Claim 10 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 10 and for the additional features recited therein.

For instance, with respect to the Claim 15, Applicant submits that the combination of Bergman, Dautartas and Erk are improper because the references teach away from such a combination. In addition to the arguments already presented with respect to Claim 10, Erk further teaches away from this three-way combination of references because the rotator of Erk is structured to operate at low speeds (i.e., 8–18 rpm) while the apparatus of Bergman depends on high rotational speeds of the wafer (e.g., 300–1500 rpm) (see Bergman at col. 6, lines 26–36).

**Dependent Claims 18–22**

Claims 18–22 depend from amended independent Claim 17 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 17 and for the additional features recited therein.

**Dependent Claims 24–30**

Claims 24–30 depend from amended independent Claim 23 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 23 and for the additional features recited therein.

**Dependent Claims 32–38**

Claims 32–38 depend from amended independent Claim 31 and are believed to be patentably distinguished over the cited art for the reasons set forth above with respect to Claim 31 and for the additional features recited therein.

**Response to Applicant's Previous Arguments**

The June 15, 2006 Final Office Action did not appear to address the arguments presented in Applicant's Response mailed March 31, 2006, with respect to the claims rejected under 35 U.S.C. § 103(a).

**REQUEST FOR TELEPHONE INTERVIEW**

Pursuant to M.P.E.P. § 713.01, in order to expedite prosecution of this application, Applicant's undersigned attorney of record hereby formally requests a telephone interview with the Examiner as soon as the Examiner has considered the effect of the arguments presented above.

**CONCLUSION**

In view of the foregoing, the present application is believed to be in condition for allowance, and such allowance is respectfully requested. If further issues remain, the Examiner is cordially invited to contact the undersigned such that the issues may be promptly resolved.

Moreover, by the foregoing amendments and remarks no admission is made that any of the above-cited references are properly combinable. Rather, Applicant submits

that even if the references are combined, the references still do not teach or suggest the claimed invention.

Please charge any additional fees, including any fees for additional extension of time, or credit overpayment to Deposit Account No. 11-1410.

Respectfully submitted,

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Dated: 9/14/2006

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